

ANNUAL ESTIMATES OF MAIZE YIELDS

A major goal of the Puebla Project was to increase production per unit area of maize; thus, an accurate and continuing measurement of yields was crucial. Maize yields could be measured by selecting a random sample of fields in the area each year, with subsequent harvesting and measuring of grain yields. This method required locating the fields, locating the farmers (who usually lived some distance away in a neighboring village), obtaining permission to harvest the necessary sample area, harvesting in the presence of the farmer, and returning the grain to the farmer. All of the sample fields had to be harvested within a brief period—from maturity of the earliest plantings to the beginning of harvest by the farmers. These considerations prompted the search for a simpler method for estimating maize yields.

Development of an Indirect Method for Estimating Yields

In 1968, an estimation of maize yields was designed and conducted to provide data for developing a simple, indirect, reasonably precise method for estimating yields. In this process, the length of ear filled with grain, diameter of the unshucked ear at the base, and weight of grain with 12 percent moisture were determined for each ear in the maize fields included in a random sample. A prediction equation was developed by regressing grain yield-per-ear on the diameter and length of the ear. This prediction equation was used to prepare a table in which ear lengths were listed as row headings, ear diameters as column headings, with grain yields composing the body of the table. A rapid and reasonably accurate estimate of yield can be made with this table, using measurements of lengths and diameters of all ears in a sample area of a maize field.

This table has been used since 1969 for making annual estimates of maize yields in the Project area. A detailed description of the statistical procedures used in developing the regression model is given in an unpublished paper (Heliodoro Diaz C., Delbert T. Myren, and Richard E. Lund, "Estimating Corn Yields in the Puebla Area with a Regression Model Based on Ear Length and Diameter").

Estimation of Yields of All Farmers in the Area

An annual estimation of maize yields was made for two categories of farmers: (a) all farmers in the area and (b) farmers on credit lists. In 1971 and 1972, in addition to estimating yields, information was collected from the farmers on the use of technology in the parcels included in the samples.

A three-stage sample was used for estimating average yields of all farmers in the area. In the first stage, the segments selected for the 1967 and 1970 surveys were used. In the second stage, a random selection of parcels was made within the segments. In the third stage, five locations of 10 lineal meters each were chosen and distributed as shown in Fig. 8.1.

The components of variance among segments, among parcels, and within parcels were calculated annually, using the maize yields estimated in the evaluation of yields. There were 25 sample segments in 1968, 36 segments in 1969 and 1970, and 31 segments in 1971 and 1972. The number of locations within a parcel remained constant from year to year. The number of parcels per segment varied as a function of the magnitudes of the variances calculated for the previous season. The selection of parcels was made using a random systematic technique, with probability proportional to size; that is, a 4 ha parcel had four times as much probability of appearing in the sample as a 1 ha parcel.

After the parcels had been selected, the field was sampled as follows. First, a coin was flipped to determine direction of entry into the field. Then the number of rows was counted from left to right. Next, using a table of random numbers, the starting row was selected. In this row, 10 out of the first 20 meters were harvested, as shown in Fig. 8.1. Then the sampling was moved five rows to the right, progressively, until a total of 50 meters had been harvested. If this procedure carried the sampling to the outer edge of the field, as shown in Fig. 8.1, the procedure was begun again on the opposite edge and the counting of rows was resumed toward the right.

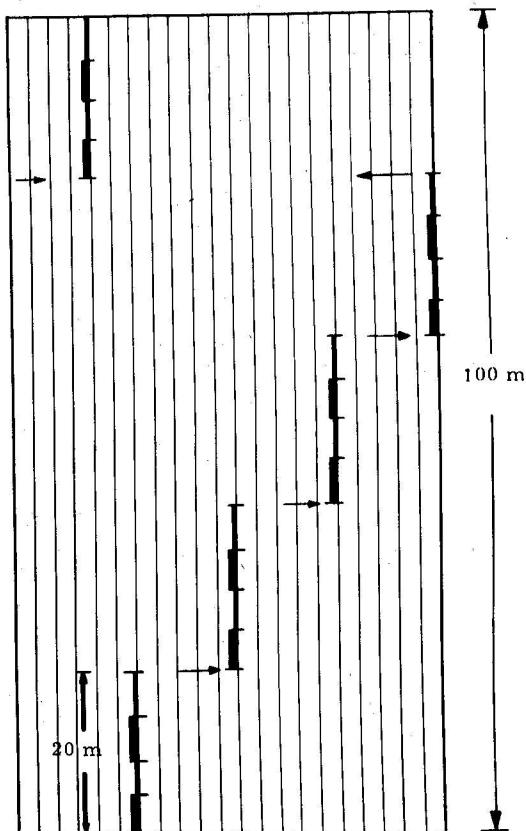


Fig. 8.1. The diagram shows the way in which the field was sampled for a total of 50 meters of harvested rows. From each 20 meters of row, two sections of 5 meters each were selected as shown.